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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/585,744

07/12/2006

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EXAMINER

AHMED, SELIM U

ART UNIT

PAPER NUMBER

2826

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DELIVERY MODE

05/13/2009

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/585,744	BANDOH ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	SELIM AHMED	2826	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 01/22/ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 22 January 2009.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 37-66 is/are pending in the application.
- 4a) Of the above claim(s) 37-56 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 55-66 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 July 2006, 30 May 2008 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>07/12/2006</u> .  | 6) <input type="checkbox"/> Other: _____                          |

**DETAILED ACTION**

***Election/Restrictions***

1. Applicant's election without traverse of Group II, including claims 55-66 in the reply filed on 01/22/2009 is acknowledged. Claim 37 is hereby rejoined as a linking claim. All other claims have been withdrawn from consideration.

***Priority***

2. Acknowledgment is made of applicant's claim for foreign priority under 35 U.S.C. 119(a)-(d). The certified copies have been filed with the application.

***Information Disclosure Statement***

3. The Information Disclosure Statements filed on 07/12/2006 have been considered.

***Oath/Declaration***

4. The oath or declaration filed on 07/12/2006 is acceptable.

***Drawings***

5. The drawings filed on 05/30/2008 are acceptable.

***Claim Objections***

6. Claim 55 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Since claim 55 is a dependent process claim based of a product claim 37, it fails to further limit the subject matter of a previous claim and thus being improper dependent form. Claims 56-66 inherit the deficiency.

Appropriate correction is required.

For the purpose of examination, although claim 55 is an improper dependent claim of independent claim 37, it was assumed that all of the subject matters from claim 37 would be incorporated into claim 55, making claim 55 an independent process claim. Applicant needs to amend the claim to include the scope of claim 37 on order to overcome the objection.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 37, 55-66 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Kawano (JP 2003-17420; Machine translation was used for examination purposes).

With regard to claim 37, Kawano discloses an n-type group III nitride semiconductor layered structure (e.g. Fig. 1) comprising a substrate 1 and, stacked on the substrate (e.g. Fig.1), an n-type impurity concentration (i.e. Ge, para[0026]) periodic variation layer (e.g. para[0042]) comprising an n-type impurity atom higher concentration layer 3 (para[0018], claims 1-4) and an n-type impurity atom lower concentration layer 4 (para[0018] claims 1-4), said n-type impurity atom being Ge (e.g. para[0042]), pits (e.g. para[0010, 0035]) being provided on a surface (Fig. 1) of the higher concentration layer 3 (a surface remote from the substrate), and said lower concentration layer 4 being stacked on said higher concentration layer (e.g. para[0042]), wherein the higher concentration layer and the lower concentration layer are provided in an alternate and periodic manner (e.g. para[0012, 0039-0042], claims 6-8) and the repetition number of said higher concentration layer and said lower concentration layer is 10 to 1000.

As discussed above, Kawano discloses all of the limitations of claim 37 with the exception of the repetition number of said higher concentration layer and said lower concentration layer is 10 to 1000. However, para[0012, 0039-0042],

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claims 6-8 of Kawano discloses more than one repetition of said higher concentration layer and said lower concentration layer is 10 to 1000. It would have been obvious to one having ordinary skill in the art at the time of the invention to form 10 to 1000 repetition number of said higher concentration layer and said lower concentration layer for predictable results.

With regard to claim 55, para[0009] of Kawano discloses a process (e.g. VPE) for producing a n-type group III nitride (e.g. GaN) semiconductor layered structure according to claim 37, wherein each of said n-type impurity atom (para[0026]) higher concentration layer and said n-type impurity atom lower concentration layer is stacked so that, in addition to the concentration of the n-type impurity to be doped, conditions for growth within a reactor are also differentiated (e.g first process, 2<sup>nd</sup> process, para[0009]).

With regard to claim 56, e.g. para[0010] of Kawano discloses the process according to claim 55 wherein conditions for growth of the lower concentration layer are differentiated from conditions for growth of the higher concentration layer so that two-dimensional growth of the layer is accelerated during the growth of the lower concentration layer.

With regard to claim 57, e.g. para[0025, 0033] of Kawano discloses the process according to claim 55, wherein the lower concentration layer is grown at

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a temperature different from the temperature at which the higher concentration layer is grown (800C and 900C).

With regard to claim 58, e.g. para[0025, 0033] of Kawano discloses the process according to claim 57, wherein the lower concentration layer is grown at a temperature (e.g. 900C) above the temperature (e.g. 800C) at which the higher concentration layer is grown.

With regard to claim 59, e.g. para[0039, 0040] of Kawano discloses the process according to claim 55, wherein the lower concentration layer is grown at a pressure different from the pressure at which the higher concentration layer is grown.

With regard to claim 60, e.g. para[0039, 0040] of Kawano discloses the process according to claim 59, wherein the lower concentration layer is grown at a pressure (e.g.  $1 \times 10^{-8}$  atm) lower than the pressure (e.g.  $2.87 \times 10^{-7}$  atm) at which the higher concentration layer is grown.

With regard to claim 61 and 62, Kawano does not specifically disclose the process wherein the carrier gas flow rate in the growth of the lower concentration layer is different from the carrier gas flow rate in the growth of the higher concentration layer or wherein the carrier gas flow rate in the growth of the lower

concentration layer is higher than the carrier gas flow rate in the growth of the higher concentration layer although in para[0037] Kawano discloses hydrogen was used as carrier gas at the time of the growth. Furthermore, para[0032] of US 20030089300 discloses that inert (i.e. carrier) gas flow can be adjusted for growth condition. It would have been obvious to one of ordinary skill in the art at the time the invention was made to optimize the flow rate of carrier gas such as claimed, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233. See also In re Peterson, 65 USPQ2d 1379.

With regard to claim 63 and 64, Kawano does not specifically disclose the process wherein the growth speed of the lower concentration layer is different from the growth speed of the higher concentration layer and wherein the growth speed of the lower concentration layer is lower than the growth speed of the higher concentration layer although in para[0039, 0040] of Kawano discloses growth rate of lower and higher concentrations layers as 50 um/hr. However, it is well known and common knowledge in the art that the growth rate can be controlled with process parameters such as, temperature, pressure, gas flow etc. It would have been obvious to one of ordinary skill in the art at the time the invention was made to optimize the growth rate such as claimed, since it has been held that where the general conditions of a claim are disclosed in the prior



art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233. See also In re Peterson, 65 USPQ2d 1379.

With regard to claim 65 and 66, Kawano does not specifically disclose the process wherein the nitrogen/III ratio in the growth of the lower concentration layer is different from the nitrogen/III ratio in the growth of the higher concentration layer and wherein the nitrogen/III ratio in the growth of the lower concentration layer is lower than the nitrogen/III ratio in the growth of the n-type impurity atom higher concentration layer. However, it is well known and common knowledge in the art to optimize the gas ratio of specific processes to meet desired process specific parameters. It would have been obvious to one of ordinary skill in the art at the time the invention was made to optimize the nitrogen/III ratio such as claimed, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. In re Aller, 105 USPQ 233. See also In re Peterson, 65 USPQ2d 1379.

### **Conclusion**

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to SELIM AHMED whose telephone number is (571)270-5025. The examiner can normally be reached on 9:00 AM-6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sue Purvis can be reached on (571)272-1236. The fax

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phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

SA

/Sue A. Purvis/  
Supervisory Patent Examiner, Art Unit 2826